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SITE UTILITY CONTROL SYSTEM SOFTWARE

User Manual

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Overview

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1 Overview of the Site Utility Control System

The Site Utility Control System allows to control temperature of telescope primary mirror and telescope building. It also control devices that supplies oil (for telescope motion), pressurized air and glycol/water mix. It has the following devices:

- Hidraulic Pressure unit (HPU): This is the oil pump. It have sensors to control the oil level and oil temperature. There are oil filters in this unit: main, circulating, and cooling.
- Two Oil Chillers: it is used to cool HPU's oil.
- Tunnel fan: It allows to keep telescope temperature near ambient temperature. The end of tunnel fan is covered by louvers that are opened when fan is switched on. The fan is controlled by a Toshiba fan controller.
- Two chillers to supply glycol/water mix: They are near the telescope buildings. One HVAC chiller supplies air conditioning on the telescope building and a second is used to supply primary mirror cooling system.
- Two Air Compressors: It supplies clean dry pressurized air. Also, there are two driers with two tower drying. In normal operation the drier should switch between the two towers periodically.

The Site Utility Control System Software has the following characteristics:

- Accept high level commands to control Site Utility units, and convert them to low level commands for the various low level controllers.
- Report the position and status of the Site Utility units.
- It allows to change temperature values, unit status, etc.

Interface

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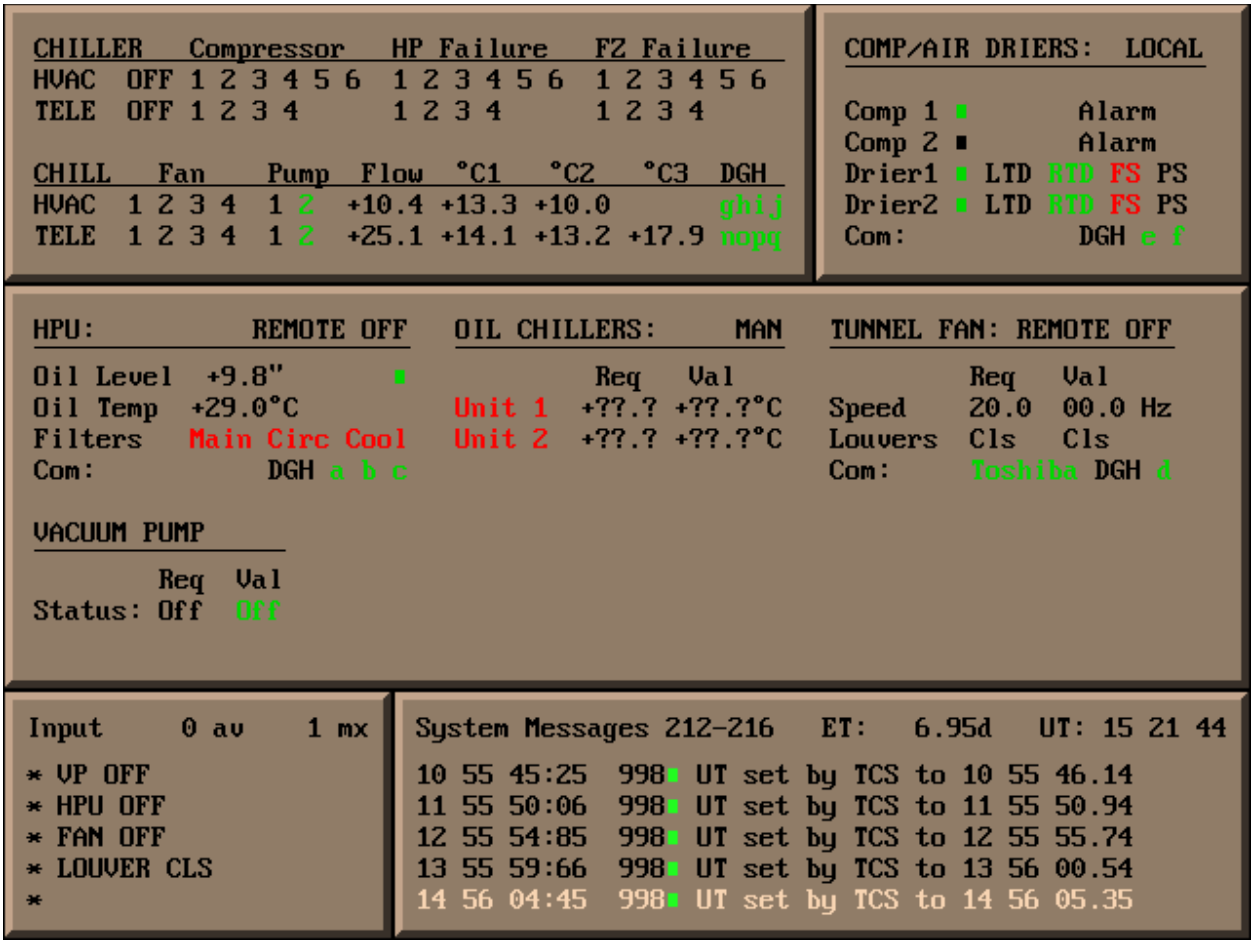
2 Site Utility Control System Interface

The next drawing is the site utility interface:



2.1 HPU Interface

The hydraulic pressure unit is the oil pump that drives the telescope's hydrostatic pads. Its status is displayed in the middle left of the SITEUTIL display. The HPU system can be switched between Local (labeled Hand on the switch) and Remote (labeled Auto on the switch) modes. The mode, either Remote or Local, is displayed to the right of the HPU label onscreen, followed by either On or Off, depending the HPU's current state. For computer control of the HPU, the HPU must be in Remote (Auto) mode.

The first line below the HPU title displays the level of oil in the HPU's reservoir, in inches. To the right of that is a LED which turns red if the oil is sensed to be too low, or green if the oil level is normal. The oil level can also be displayed in mV (the raw load cell output) using the LEVEL command, if the mV to inches conversion factors (in SITEUTIL.INI) need to be calibrated. Immediately below the oil level line is an oil temperature indication in degrees C. The next line displays the status of the oil filters in the HPU. There are three filters: main, circulating, and cooling. If a filter needs to be changed the filter name will turn red onscreen, otherwise the filter name is black. Note that not all filters are always used, so one of these might be red without actually indicating the need for a filter change. The final line displays the current communication status with the three DGH modules used to read all HPU data, DGH modules "a", "b", and "c". These should be lit green. If they're red, some HPU status will be displayed as question marks until communication is resumed. If communication is down, it's likely that the HPU just isn't getting power.

2.2 Oil Chiller Interface

The HPU's oil is cooled by a pair of oil chillers. Their status is displayed in the section to the right of the HPU's display. The two chillers are listed as Unit 1 and Unit 2. If their name is in red, communication with them is down. This typically indicates that they simply aren't powered on. At the time of this writing, they are set to turn on when oil flow rises to a certain level (meaning that the HPU has been turned on). So, to turn them on remotely simply turn on the HPU. To be in this mode, the switch on their front panel should be set to Local. The Remote setting doesn't do anything at this time.

To the right of the unit names are two columns, the requested and current temperature of the oil in that chiller in degrees C. If communication is down with the chillers, these temperatures will be displayed as question marks.

2.3 Tunnel Fan Interface

The entire telescope structure is kept near ambient temperature by a very large tunnel fan. The end of the tunnel is covered by louvers, which must be open to run the fan. The fan is driven by a Toshiba fan controller. Note that the fan should be on and the louvers open any time the HPU and oil chillers are run, or else the tunnel heats up considerably.

The fan's status is displayed to the right of oil chillers onscreen. Like the HPU, it can be in either Remote or Local mode (controlled by the Remote/Local button on the Toshiba), and either On or Off. Below the tunnel fan title are displayed the current and requested fan speeds in hertz. Below that is displayed the current state of the louvers, either open or closed. Note that the louvers only read as open when they're all the way open. Thus they will say they are closed for some time after a LOUVER OPN command, until they're all the way open. The final line displays the current communication status with the Toshiba and DGH module "d". The word Toshiba will be red if communication is down, green if it's OK. The DGH is displayed similarly. If communication with either is down, parts of the display will change to question marks indicating an unknown state. Again, the most likely cause for failed communication is that power is off.

2.4 HVAC and Telescope Chiller Interface

There are a pair of very large chillers a short way down the hill, which supply a chilled glycol/water mix to the facility. The HVAC chiller supplies air conditioning units in the building while the telescope chiller supplies the primary mirror cooling system. The status of these two systems are displayed in the top left panel. In the first column, to the right of each one's label is displayed whether the chiller is On or Off. Note that this indication is only valid if the chiller is in Remote mode, set by a switch at the unit.

The second column displays which compressors are on (green = on, black = off). The next two columns indicate high pressure failures or freeze failures (red = fail, black = OK). In the lower part of the panel there is set of chillers related indications. First is a display of which fans and pumps are energized (green = on, black = off). There is then a pump flow display. At the time of this writing, the pump fluid flow display has not yet been calibrated, so the reading is in mA instead of a more meaningful unit. Next to be displayed are fluid temperatures in degrees C, going into the chiller (the first number °C1) and exiting the chiller (the second number °C2). The last column displays the communication status with the four associated DGH modules. If any of these are red (indicating communication errors), parts of the display will show question marks instead of values. As usual, communication errors usually indicate that power is not on.

2.5 Compressor/Air Drier Interface

The panel located at the top right of the screen displays the status of the air compressors and their associated air driers. These units (down the hill next to the HVAC and Telescope Chillers) are used to supply clean dry pressurized air to the facility.

The two compressors are listed as Comp 1 and Comp 2. The two names are black if communication is functional, or red if communication is down. The LED next to the name is black if the unit is off, green if it's on. The following field displays which run mode the compressor is in: Run, Stop, Lag or Lead. If the two compressors are running simultaneously, one should be set to lag and one to lead (the compressor set to lead does the bulk of the work while the one set to lag assists when large air flows are needed). The last entry, Alarm, lights red if the compressor has experienced a fault condition and black otherwise.

The two driers are listed as Drier1 and Drier2. As with the compressors, the name is red if communication is down and black if communication is normal. The LED next to the name lights green if that drier's power is on, black if it's not. LTD and RTD stand for left and right tower drying. They will light green if the tower is drying, or be black if it's not in use. In normal operation the drier should switch between the two towers periodically. To the right of these indicators is an error indicator, FS. FS stands for Fail-to-Shift, which means the drier failed to switch between towers for some reason. FS will light red in this case, and be black during normal operation. Next is PS, which lights green if the drier is using power-saving mode, and is black otherwise. The final line displays the communication status of the two DGHs used to control and monitor the driers and compressors. Green indicates that communication is up, red indicates an error. As always, if they're red power probably isn't on. If communication is down some fields will not be displayed or will be displayed as question marks.

Commands

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3 Commands Summary

All SITEUTIL commands begin with a command code, followed by one or more arguments. The arguments and the command must all be separated by spaces. Letters may be upper or lower case. The backspace key moves the cursor back one character at a time. All commands are terminated by a <cr>. Hit <F1> for a quick command help screen.

3.1 User Commands

Command	Description
HPU *n*	Turn HPU on or off when in remote mode (*n* = ON / OFF).
CHIL *n m*	Set oil chiller *n* target temperature to *m* (*n* = 1 / 2, *m* = 0.0 …30.0° C)
CHIL *n*	Set oil chiller to *n*= MAN/AUTO
FAN *n*	Tunnel fan command when in remote mode (*n* = ON / OFF / RESET or 0.0 …60.0, fan speed in Hz)
LOUVER *n*	Command tunnel fan louvers (*n* = OPN / CLS).
HVAC *n*	Turn HVAC Chiller on or off (*n* = ON / OFF).

TELE *n*	Turn Telescope Chiller on or off (*n* = ON / OFF).
COMP *n m*	Set air compressor *n* to run-mode *m* (*m* = RUN / STOP / LAG / LEAD).
COMP *n*	Set air compressor to *n* = LOCAL/REMOTE
VP *n*	Turn Vacuum Pump on or off (*n* = ON / OFF). This pump supplies vacuum for the M2 and M3 support systems.

3.2 Message Commands

Command	Description
<Up>	Scroll system message display back one line.
<Pg Up>	Scroll system message display back one page
<Down>	Scroll system message display forward one line
<Pg Dn>	Scroll system message display forward one page
<Home>	Set system message display to show the first message
<End>	Set system message display to show the current message

3.3 Display Commands

Command	Description
<F1>	Display online help screen.

<Scroll Lock>	Pause/Resume system log messages
VERB *n*	Set system log verbose level to *n* (*n* = 0 ..2)

3.4 Engineering Commands

Command	Description
LEVEL	Toggle HPU Oil level display between inches and mV (for calibration).
TD	Terminal with DGH modules on COM 1:
T3	Terminal with DGH modules on COM 1: at 300 baud (for module setup).
TM	Terminal with mirror telescope on COM 5:
<F2>	Dump system log to the file "TEMP.LOG".
<F3>	Dump screen to the file "SCREEN.BMP" (in Windows BMP format).

3.5 Other Commands

Command	Description
Q / EXIT	Exit the program

Configuration

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4 Site Utility Configuration

4.1 Sitiutil.ini file, Magellan I

```
;
; Last modified: 10/28/2002 by JMS.
;
; This file contains all easily modified initialization data for the site
; utility program.  Lines starting with a ";" are ignored.
; Every other line contains a description followed by an equal sign
; followed by a data value. DO NOT change the order of the data values
; (the program ignores the description in front of them) and DO NOT
; add blank lines between values.
;
; Telescope the program is running at
Magellan = 1
; Serial communication constants
;  Address of this computer on the line to the host computer
Address = "L"
;  Prompt character for this computer
Prompt = ":"
```

```
;  Response character of this computer

Response = "~"

; Amount in parts-per-million to speed up or slow down the system clock

; Use this to make the system clock as accurate as desired

ClockPPM = 149

; Fluid level = ((DGH 1500 reading in mV) * slope) + zero

; Zero point for HPU fluid level mV -> inches conversion

HPU.Zero1500 = 9.0

; Slope for HPU fluid level mV -> inches conversion

HPU.Slope1500 = 3.0

; Control offset from ambient temperature (in deg C) for the oil chillers

Chiller.Tempoff1 = -0.5

Chiller.Tempoff2 = -1.0
```

4.2 Siteutil.ini , Magellan II

4.3 Siteutil.ini Description

The Site Utility program reads a small amont of configuration data from the file "SITEUTIL.INI", which is in the same directory as the Site Utility program. This is a simple text file which can be edited with any text editor. All lines starting with a ";" are ignored, all other lines are significant. Non-comment lines will have a label, an equal sign, and a value. Do not change the order of the lines, or add blank lines that aren't begun with a ";", as this will interfere with the SITEUTIL program's ability to read the file. The following values can be set in this file:

Address: The address character that the SITEUTIL program responds to (as per the control system serial communication documents). This should be "L".

Prompt: The prompt character that the SITEUTIL program responds to. This should be ":".

Response: The response character that precedes all SITEUTIL replies. This should be "~".

ClockPPM: A number, in parts per millionth of a second, to speed up or slow down the system clock. This should be used to match UT as closely as possible. To set, allow the TCS to set the SITEUTIL's UT several times over the course of many hours. If the timestamps of the UT Set messages in the system log are ahead of the time being set, increase ClockPPM by 1000000 * (amount ahead by in seconds / time since last UT Set message in seconds), otherwise decrease by the same amount. This number will have to be modified if the computer being used to run the SITEUTIL program is changed. Set this number to zero if you're unsure.

HPU.Zero1500: HPU's oil level reading in inches when the oil level sensor reads 0 mV. This and the following entry are used to calibrate the HPU's oil reservoir level display in inches, by converting the reading from a DGH module. Toggle the reading between mV and inches with the LEVEL command.

HPU.Slope1500: Number of inches of oil per mV read on the oil level sensor.

4.4 Starting the Program

To start the SITEUTIL program, push the reset button (the black rocker switch just below the red power switch) on the computer. The program will load automatically from the solid-state disk. Resetting the computer insures that the system will start each time in the proper state.

When the program is loaded, you should see the usual video display of site utility data. You can type commands which appear at the "*" prompt in the input panel. At the top of the input panel the average and maximum cycle times for the program's main loop are displayed in milliseconds.

Status messages are displayed in the system message box. The UT at which the message occurred is followed by a three-digit message identification code. A red LED indicates that the message describes error. A green LED indicates that the message describes a normal condition or success. Most errors are caused by serial communication errors, or by some piece of remote equipment being turned off. A certain number of errors may occur when the program is loaded, before the serial communications are properly initialized. A few errors will occur during normal operation.

The messages are numbered from 0 to 999. When the message buffer is full, new messages are written over the old ones starting from the beginning (so message 1000

is written to location 0 and so on). The most recent message is displayed in white. You can scroll back and forth through the message buffer using the cursor keys. To return to the page with the most recent message, be sure to use <End>, or else new messages will not appear on your screen (although new messages will *always* be written to the message buffer).

The elapsed time, in days, that the program has been running is shown next to the "ET" entry, and the current UT is shown as well. The UT is set by the CMOS clock in the computer when the program starts, but it is updated by the TCS as soon as communication is established, and once per hour after that.

Serial Communication

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5 Control System Serial Communication Standards

There is always a host (upstream) computer, and a guest (downstream) computer. The host computer is frequently the TCS, with the guest being Site Utility computer. The host system sends a command, and the guest responds immediately to that command. Guest computers never broadcast without being queried, which allows multiple guests to be chained on the same serial line.

Full command format:

:Lnddddddddddccr

The "**:**" is the prompt character to initiate communication. **L** is the guest computer's unit address, in this case is Site Utility computer. **n** is a command number, **d**'s are data specific to the command (variable length), **cc** is a checksum, and **r** is a carriage return (ASCII 13).

Full response format:

~Lnddddddddccr

The "~" is the response character for guest computer responses. **L** is the guest computer's unit address. **n** is the command number this is in response to, **d**'s are data specific to the response (variable length), **cc** is a checksum, and **r** is a carriage return (ASCII 13).

For very short commands and responses the checksum may be omitted (this is noted in the command description).

For all commands and responses that include a checksum, the checksum is composed of two hexadecimal digits (from 0-F). The checksum is calculated by starting with zero and XORing it with all characters in the message from the unit letter to the last data character before the checksum (the underlined part of the command and response above).

Commands that are received but misunderstood (checksum wrong, unknown command, etc) are replied to like this:

```
~L?r
```

Most guest computers maintain a running system log that contains important messages and all system status information. Each also maintains a pointer into that log that keeps track of the oldest message that hasn't been sent to the host computer. The "2" and "3" commands let the host computer command the guest computer to transmit one of its log entries or re-transmit the last entry. This is referred to as the "Engineering Data Stream", or EDS.

Command Summary:

2: Query Next EDS Message

3: Repeat Last EDS Message

4: Set UT

9: Free-form Command

5.1 Command Description

2: Query Next EDS Message

Commands the guest computer to send its oldest un-sent EDS log entry, and advance its internal pointer to the next EDS log entry.

Command Format: `:L2r` (note that this command has no checksum)

Response Format: `~L2qqnnttttttttfffddddddccr`

L: Guest Site Utility computer address (usually an upper-case letter)

qq: Two-digit number of EDS messages left in the guest queue

nn: Two-digit number of characters in the message (in the underlined section). 00 if no message available.

tttttttt: Eight-digit message time stamp (no punctuation), with two-digit hour, two-digit minute, two-digit second, and two-digit hundredths of a second.

fff: Three-digit message number. Message numbers from 0-799 denote errors, 800-899 are numberical data formats, and 900-999 are successes.

ddddddd: Variable length message data section. For error and success messages, typically a simple text message. For numeric data formats, a combination of ASCII, decimal, and hexadecimal characters/digits, with the format being determined by the particular message number.

cc: Checksum, described above.

r: ASCII charater 13, a carriage return.

3: Repeat Last EDS Message

Commands the guest computer to re-send the last message it sent (implying that the host computer had a serial communication error during the last reponse). The guest's internal pointer should remain unchanged.

Command Format: `:L3r` (note that this command has no checksum)

Response Format: ~L3qqnntttttttfffddddddccr

L: Guest computer address (usually an upper-case letter)

qq: Two-digit number of EDS messages left in the guest queue

nn: Two-digit number of characters in the message (in the underlined section). 00 if no message available (there is no time stamp, message number, or data in this case).

ttttttt: Eight-digit message time stamp (no punctuation), with two-digit hour, two-digit minute, two-digit second, and two-digit hundredths of a second.

fff: Three-digit message number. Message numbers from 0-799 denote errors, 800-899 are numberical data formats, and 900-999 are successes.

ddddddd: Variable length message data section. For error and success messages, typically a simple text message. For numeric data formats, a combination of ASCII, decimal, and hexadecimal characters/digits, with the format being determined by the particular message number.

cc: Checksum, described above.

r: ASCII charater 13, a carriage return.

4: Set UT

Commands the guest computer to set its clock to the Universal Time given in this command. The control computers keep their clocks synchronized to GPS-provided universal time in this way.

Command Format: :L4ttttttttccr

Response Format: ~L4er (note that this response has no checksum)

L: Guest computer address (usually an upper-case letter)

ttttttt: Eight-digit universal time (no punctuation), with two-digit hour, two-digit minute, two-digit second, and two-digit hundredths of a second.

cc: Checksum, described above.

r: ASCII charater 13, a carriage return.

e: Error flag: 0 if an error occurred, 1 if OK.

9: Free-form Command

Sends the guest Site Utility computer a free-form command, typically similar to the commands entered via the guest computer's keyboard. This is used to command moves, homes, etc.

Command Format: :L9nndddddddccr

Response Format: ~L9ennmmmmccr

L: Guest computer address (usually an upper-case letter)

nn: Two-digit number of characters in the message (in the underlined section). 00 if no message available.

ddddddd: Variable length free-form command section. This section will contain a command parseable by the guest computer, such as "MOVE 1000"

cc: Checksum, described above.

r: ASCII charater 13, a carriage return.

e: Error flag: 0 if OK, 1 or higher if an error occurred.

mmmm: Variable length diagnostic message (such as "Move ignored, brake on"). This should be printed out by the host computer in the command input box if the command was given by the user, or in the system log if the command was given by an automated routine in the host program. nn=00 in the response if there is no diagnostic message.

Log Message System

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6 Log Message System

Last updated 7/14/99

Note that for error messages with an error code, the error code is just used to find where in the program's source code the error occurred, and is used to find bugs. The system log in verbose mode should be used in most cases to diagnose strange problems. Then, just recreate the problem/error message and hit the log dump function key. There should be very explicit error messages that tell what was sent to devices, and how they responded, and what the program was expecting.

// Errors (0-799)

002: "DGH x setup wrong, got "xxxxx", expected "xxxxx"

The setup string of the DGH with address x on COM1: was different than expected. Setup the DGH to match the expected setup string with the TD or T3 commands. If the expected setup string needs to be changed, change it in the source code and recompile.

003: "DGH x com error n"

The DGH module with address x on COM1: had a communications error. Check communication with the TD command, or put the log in verbose mode to see what is being said between the computer and the DGH. The error number given helps pinpoint where in the source code the error occurred.

004: "DGH x error messages suspended"

The DGH module with address x on COM1: had too many consecutive communication errors. Further error messages will be suppressed.

005: "Fan command ignored, communication down"

There are communication problems with DGH d, so the given fan or louver command was ignored.

006: "Fan command ignored, in local mode"

The Toshiba fan controller is in local mode, so the fan cannot be commanded to run or stop remotely. Push the local/remote button on the Toshiba to switch to remote mode.

007: "Vent fan com error n"

There was a communications error with the Toshiba tunnel ventilation fan controller. If the tunnel fan display says "Fan Fault" you might be able to reset the error with the FAN RESET command. The most common fault is an over-voltage during deceleration. The fault will be displayed on the Toshiba's control panel. The other possibility is that there are genuine communication problems. Look at the system log in verbose mode to check for Toshiba commands and responses, and check communication wiring.

008: "Vent fan error messages suspended"

There were to many communication errors with the Toshiba fan controller. Further error messages will be suppressed.

009: "Oil Chiller x com error n"

There was a communications error with the oil chiller with address x. This can mean several things: the chiller might be off, the chiller might be on but with no oil flow, or there are actual wiring or other communications problems.

010: "Oil Chiller x error messages suspended"

There were too many com errors with the given chiller. Further error messages will be suppressed.

011: "Fan command ignored, fan may not run with louver closed"

You tried to close the ventilation fan louvers with the fan running, or run the fan with the louvers closed.

012: "Host com error x"

There was a host (TCS) communications error. Put the log into verbose mode to see what is being said between the computer and the TCS. The error number given helps pinpoint where in the source code the error occurred.

013: "Host error messages suspended"

The host (TCS) had too many consecutive communication errors. Further error messages will be suppressed.

6.1 EDS Log data formats (800-899)

800: Hidraulic Pressure Unit (HPU) information.

Format: 800aaaaabbbbbbccccddddeeeef

aaaaa: HPU Oil Level in inches (float)

bbbbbb: HPU Oil Level in mV (float)

ccccc: HPU Oil Temperature in degrees C (float)

dddd: DGH a Reading (hex)

0..1: bit 0=1 and bit 1=1: Local mode (Hand switch), Off

0=1 and bit 1=0: Local mode (Hand switch), On

0=0 and bit 1=1: Remote mode (Auto switch)

2: 0 = Oil Level OK, 1 = Oil Level LOW

3: 0 = Main Pump Filter OK, 1 = Main Pump Filter Error

4: 0 = Circulating Pump Filter OK, 1 = Circulating Pump Filter Error

5: 0 = Cooling Pump Filter OK, 1 = Main Pump Filter Error

12: 0 = Remote Turn On ON, 1 = Remote Turn On OFF

eeee: DGH d Reading (hex)

0: Toshiba Fan Controller Remote Reset (0 = Reset, 1 = Normal)

1: Louver Command (0 = Open, 1 = Close)

2: Toshiba Fault (0 = OK, 1 = Fault)

3: Toshiba Fan Remote Command (0 = Run, 1 = Stop)

f: HPU status bits (hex)

0: DGH a Com Error (0=OK,1=Error)

1: DGH b Com Error (0=OK,1=Error)

2: DGH c Com Error (0=OK,1=Error)

3: DGH d Com Error (0=OK,1=Error)

801: Fan status, Toshiba and oil chillers status

Format: 801aaaabbbbcdddeeeeffffggggh

aaaa: Commanded Fan Speed (Hz * 100, ie 1234 = 12.34 Hz) (int)

bbbb: Current Fan Speed (Hz * 100, ie 1234 = 12.34 Hz) (int)

cccc: Toshiba status bits (hex)

0: Local mode (0 = Remote, 1 = Local)

1: Local Run/Stop State (0 = Off, 1 = On)

2: Louver Open (0 = Closed, 1 = Open)

3: Com Error (0 = OK, 1 = Error)

dddd: Oil Chiller 1 Requested Temp (degrees C * 10, ie 123 = 12.3) (int)

eeee: Oil Chiller 1 Current Temp (degrees C * 10, ie 123 = 12.3) (int)

ffff: Oil Chiller 2 Requested Temp (degrees C * 10, ie 123 = 12.3) (int)

gggg: Oil Chiller 2 Current Temp (degrees C * 10, ie 123 = 12.3) (int)

h: Oil Chiller Status (hex)

0: Oil Chiller 1 Com Error (0=OK, 1=Error)

1: Oil Chiller 2 Com Error (0=OK, 1=Error)

802: HVAC chillers (to supply glycol/water mix) information

Format: 802aaaabbbbccccddddeeeef

aaaa: DGH g Reading (hex)

0: HVAC Chiller Remote On/Off

1: Compressor 1 On/Off

2: Compressor 2 On/Off

3: Compressor 3 On/Off

4: Compressor 4 On/Off

5: Compressor 5 On/Off

6: Compressor 6 On/Off

7: High Pressure 1 Fail

8: Freeze 1 Fail

9: High Pressure 2 Fail

10: Freeze 2 Fail

11: High Pressure 3 Fail

12: Freeze 3 Fail

13: High Pressure 4 Fail

14: Freeze 4 Fail

bbbb: DGH h Reading (hex)

0: High Pressure 5 Fail

1: Freeze 5 Fail

2: High Pressure 6 Fail

3: Freeze 6 Fail

4: Fan 1 On

5: Fan 2 On

6: Fan 3 On

7: Fan 4 On

8: Pump 1 On

9: Pump 2 On

10: Pump 1 Fail

11: Pump 2 Fail

cccc: HVAC Chiller Pump flow (mA * 10, ie 123 = 12.3 ma) (int)

dddd: HVAC Chiller Incoming temperature (degrees C * 10, ie 123 = 12.3) (int)

eeee: HVAC Chiller Outgoing temperature (degrees C * 10, ie 123 = 12.3) (int)

f: HVAC status bits (hex)

0: DGH g Com Error (0=OK, 1=Error)

1: DGH h Com Error (0=OK, 1=Error)

2: DGH i Com Error (0=OK, 1=Error)

3: DGH j Com Error (0=OK, 1=Error)

803: Telescope chiller information

Format: 803aaaabbbbccccddddeeeeffffg

Telescope Chiller bit senses not yet known

aaaa: DGH n Reading (hex)

0: Telescope Chiller Remote On/Off

1: Compressor 1 On/Off

2: Compressor 2 On/Off

3: Compressor 3 On/Off

4: Compressor 4 On/Off

7: High Pressure 1 Fail

8: Freeze 1 Fail

9: High Pressure 2 Fail

10: Freeze 2 Fail

11: High Pressure 3 Fail

12: Freeze 3 Fail

13: High Pressure 4 Fail

14: Freeze 4 Fail

bbbb: DGH o Reading (hex)

4: Fan 1 On

5: Fan 2 On

6: Fan 3 On

7: Fan 4 On

8: Pump 1 On

9: Pump 2 On

10: Pump 1 Fail

11: Pump 2 Fail

cccc: Telescope Chiller Pump flow (mA * 10, ie 123 = 12.3 ma) (int)

dddd: Telescope Chiller Incoming temperature (degrees C * 10, ie 123 = 12.3) (int) (ReadingDGHq[0])

eeee: Telescope Chiller Outgoing temperature (degrees C * 10, ie 123 = 12.3) (int) (ReadingDGHq[1])

ffff: (ReadingDGHq[2])

g: Telescope Chiller status bits (hex)

0: DGH n Com Error (0=OK, 1=Error)

1: DGH o Com Error (0=OK, 1=Error)

2: DGH p Com Error (0=OK, 1=Error)

3: DGH q Com Error (0=OK, 1=Error)

804: Air driers and compressors information

Format: 804aaaabbbbc

Compressor/Air Drier bit senses not yet known

aaaa: DGH e Reading (hex)

0: Comp 1 Auto Lag Output

1: Comp 1 Auto Lead Output

2: Comp 1 Stop Output

3: Comp 1 Constant Run Output

4: Comp 1 24 VAC On

5: Comp 1 Alarm

6: Comp 2 Auto Lag Output

7: Comp 2 Auto Lead Output

8: Comp 2 Stop Output

9: Comp 2 Constant Run Output

10: Comp 2 24 VAC On

11: Comp 2 Alarm

bbbb: DGH f Reading (hex)

0: Drier 1 Power On

1: Drier 1 Left Tower Drying

2: Drier 1 Right Tower Drying

3: Drier 1 Fail to Shift

4: Drier 1 Purge Saver On

5: Drier 1 Power On

6: Drier 1 Left Tower Drying

7: Drier 1 Right Tower Drying

8: Drier 1 Fail to Shift

9: Drier 1 Purge Saver On

c: Air Drier/Compressor status bits (hex)

0: DGH e Com Error (0=OK, 1=Error)

1: DGH f Com Error (0=OK, 1=Error)

Successes (900-999)

6.2

993: "Host error messages resumed"

Communication with the host (TCS) was restored.

994: "Oil Chiller x error messages resumed"

Communication with the given oil chiller was restored. Future com errors will be displayed again.

995: "Vent fan error messages resumed"

Communication with the Toshiba ventilation fan controller was restored. Future com errors will be displayed again.

996: "DGH x error messages resumed"

Communication with the given DGH module was restored.Future com errors will be displayed again.

997: "Screen dumped to SCREEN.BMP"

The screen was captured and dumped to the file SCREEN.BMP. It can be viewed in Windows.

999: "Program startup (vx.xx)"

First log entry after program startup (with version number)

System Details

7

7 Site Utility Control System differences between Magellan I and II

Troubleshooting

8

8 Troubleshooting